

(e) If the composition of the exhaust gas is influenced by any treatment such as heat exchanger or air injection (except catalysts and soot filters) then the exhaust probe must be taken upstream of this device.

**§ 89.414-96 Air flow measurement specifications.**

(a) The air flow measurement method used must have a range large enough to accurately measure the air flow over the engine operating range during the test. Overall measurement accuracy must be  $\pm 2$  percent of the reading for all modes except the idle mode. For the idle mode, the measurement accuracy shall be  $\pm 5$  percent or less of the reading. The Administrator must be advised of the method used prior to testing.

(b) When an engine system incorporates devices that affect the air flow measurement (such as air bleeds) that result in understated exhaust emission results, corrections to the exhaust emission results shall be made to account for such effects.

**§ 89.415-96 Fuel flow measurement specifications.**

The fuel flow rate measurement instrument must have a minimum accuracy of  $\pm 1$  percent of full-scale flow rate for each measurement range used. An exception is allowed at the idle point. For this mode (idle), the minimum accuracy is  $\pm 2$  percent of full-scale flow rate for the measurement range used. The controlling parameters are the elapsed time measurement of the event and the weight or volume measurement.

**§ 89.416-96 Raw exhaust gas flow.**

The exhaust gas flow shall be determined by one of the methods described

in this section and conform to the tolerances of Table 3 in appendix A to subpart D:

(a) Measurement of the air flow and the fuel flow by suitable metering systems (for details see SAE J244. This procedure has been incorporated by reference. See § 89.6.) and calculation of the exhaust gas flow as follows:

$$G_{EXHW} = G_{AIRW} + G_{FUEL} \quad (\text{for wet exhaust mass})$$

or

$$V_{EXHD} = V_{AIRD} + (-.767) \times G_{FUEL} \quad (\text{for dry exhaust volume})$$

or

$$V_{EXHW} = V_{AIRW} + .749 \times G_{FUEL} \quad (\text{for wet exhaust volume})$$

(b) Exhaust mass calculation from fuel consumption (see § 89.415-96) and exhaust gas concentrations using the method found in § 89.418-96.

**§ 89.417-96 Data evaluation for gaseous emissions.**

For the evaluation of the gaseous emission recording, the last 60 seconds of each mode are recorded, and the average values for HC, CO, CO<sub>2</sub>, and NO<sub>x</sub> during each mode are determined from the average concentration readings determined from the corresponding calibration data.

**§ 89.418-96 Raw emission sampling calculations.**

(a) The final test results shall be derived through the steps described in this section.

(b) The exhaust gas flow rate  $G_{EXHW}$  and  $V_{EXHW}$  shall be determined (see § 89.416-96) for each mode.

(c) When applying  $G_{EXHW}$  the measured concentration shall be converted to a wet basis according to the following formula, if not already measured on a wet basis.

$$K_w = \left[ 1 - F_{FH} \times \frac{G_{fuel}}{G_{air}} \right] - K_{w1} \quad \text{only applicable for raw exhaust}$$